

CLAIMS

1. A lamp driver device for driving a fluorescent lamp in an optical display, the lamp driver device comprising:

a power recovery and control circuit, the power recovery and control circuit coupled to a lamp interface and feeding back excess energy from the lamp interface to a power source, the power recovery and control circuit including a current limiter, the current limiter disabling power in the lamp driver when the excess energy feeding back into the power source has a current above a selected value.
2. The lamp driver device of claim 1 further comprising a logarithmic amplifier, the logarithmic amplifier having a relatively high gain at low luminance levels and an exponentially decreasing gain as luminance levels in the fluorescent lamp rise.
3. The lamp driver device of claim 2 wherein the logarithmic amplifier further includes a temperature compensating resistor selected to compensate the logarithmic amplifier for changes in temperature, and further includes a pair of matched transistors and wherein the temperature compensating resistor is selected to compensate for temperature in the pair of matched transistors.
4. The lamp driver device of claim 2 wherein the logarithmic amplifier further includes an op amp with negative feedback, and wherein the op amp with negative feedback is configured to drive a current such that substantially zero volts are across a photo-diode to compensate for temperature differences in the photo-diode.

5. The lamp driver device of claim 1 wherein the lamp driver device further comprises a power controller, the power controller receiving a signal proportional to current in the fluorescent lamp, the power controller limiting current in the fluorescent lamp when the current begins to exceed a predetermined level.
6. A lamp driver device for driving a fluorescent lamp in an optical display, the lamp driver device comprising:

a logarithmic amplifier, the logarithmic amplifier having a relatively high gain at low luminance levels and a relatively low gain at high luminance levels; and

a power recovery and control circuit, the power recover and control circuit coupled to a lamp interface and feeding back excess energy from the lamp interface to a power source, the logarithmic amplifier and power recovery and control circuit providing a precise control of plasma in the fluorescent lamp to reduce collisions with mercury atoms in the fluorescent lamp.
7. The lamp driver device of claim 6 wherein the power recovery and control circuit includes a current limiter, the current limiter disabling power in the lamp driver when the excess energy feeding back into the power source has a current above a selected value.
8. The lamp driver device of claim 6 wherein the logarithmic amplifier has an exponentially decreasing gain as luminance levels in the fluorescent lamp rise.

9. The lamp driver device of claim 6 wherein the logarithmic amplifier further includes a temperature compensating resistor selected to compensate the logarithmic amplifier for changes in temperature, and further includes a pair of matched transistors and wherein the temperature compensating resistor is selected to compensate for temperature in the pair of matched transistors.
10. The lamp driver device of claim 6 wherein the logarithmic amplifier further includes an op amp with negative feedback, and wherein the op amp with negative feedback is configured to drive a current such that substantially zero volts are across a photo-diode to compensate for temperature differences in the photo-diode.
11. The lamp driver device of claim 6 wherein the lamp driver device further comprises a power controller, the power controller receiving a signal proportional to current in the fluorescent lamp, the power controller limiting current in the fluorescent lamp when the current begins to exceed a predetermined level.
12. A lamp driver device for driving a fluorescent lamp in an optical display, the lamp driver device comprising:
 - a logarithmic amplifier, the logarithmic amplifier coupled to receive a lamp output measurement and amplify the lamp output measurement, the logarithmic amplifier having a relatively high gain at low luminance levels and a relatively low gain at high luminance levels to reduce e-field strength in the lamp at high luminance levels;
 - a power recovery and control circuit, the power recover and control circuit coupled to a lamp interface and a power source, the power recovery and control circuit feeding back energy from the lamp interface to the power source when a voltage at the lamp interface rises above a first level and disabling power to the driver when the voltage rises above a second level.

13. The lamp driver device of claim 12 wherein the lamp output measurement comprises a photo-diode measurement, and wherein the logarithmic amplifier further includes an op-amp with negative feedback, and wherein the op-amp with negative feedback is configured to drive a current such that substantially zero volts are across the photo-diode to compensate for temperature differences in the photo-diode.
14. The lamp driver device of claim 13 wherein the logarithmic amplifier further includes a pair of matched transistors and a temperature compensating resistor, with at least one of the pair matched transistors coupled to the op-amp input, and wherein the temperature compensating resistor is selected and configured to compensate for temperature in the pair of matched transistors.
15. The lamp driver device of claim 12 wherein the logarithmic amplifier has an exponentially decreasing gain as luminance levels rise.

16. A lamp driver device for driving a fluorescent lamp in an optical display, the lamp driver device comprising:

a lamp interface, the lamp interface coupled to the fluorescent lamp to provide power to the fluorescent lamp;

a power recovery and control loop, the power recover and control loop coupled to the lamp interface and feeding back excess energy from the lamp interface to a power source; and

an optical feedback loop, the optical feedback loop including an photon-to-current converter, a logarithmic amplifier, an error amplifier and a hysteretic comparator, the photon-to-current converter measuring a luminance output from the fluorescent lamp and outputting a measured luminance output, the logarithmic amplifier coupled to the photon-to-current converter and amplifying the measured luminance output to generate a logarithmic amplifier output, the logarithmic amplifier having a relatively high gain at relatively low luminance levels and a relatively low gain at relatively high luminance levels, the error amplifier coupled to and receiving the logarithmic amplifier output, the error amplifier summing the logarithmic amplifier output to a luminance command signal and generating an error amplifier output, the hysteretic comparator comparing the error amplifier output to a signal mirroring plasma current dynamics in the lamp and driving the lamp to generate a luminance level where the logarithmic amplifier output corresponds to the luminance command level.

17. The lamp driver device of claim 16 wherein the lamp driver device further comprises a power controller receiving a signal proportional to current in the fluorescent lamp, the power controller coupled to the error amplifier to limit current in the fluorescent lamp when the signal proportional to the current in the fluorescent lamp indicates that current in the lamp is exceeding a predetermined level.

18. The lamp driver device of claim 17 wherein the power controller further receives a signal from the power recovery and control circuit, the power controller shutting down the error amplifier when the signal from the power recovery and control circuit indicates that the current in the fluorescent lamp exceeds a second predetermined level.
19. The lamp driver device of claim 16 wherein the photon-to-current converter comprises a photo-diode, and wherein the logarithmic amplifier further includes an op-amp with negative feedback, and wherein the op-amp with negative feedback is configured to drive a current such that substantially zero volts are across the photo-diode to compensate for temperature differences in the photo-diode.
20. The lamp driver device of claim 19 wherein the logarithmic amplifier further includes a pair of matched transistors and a temperature compensating resistor, with at least one of the pair matched transistors coupled to the op-amp input, and wherein the temperature compensating resistor is selected and configured to compensate for temperature in the pair of matched transistors.
21. The lamp driver device of claim 16 wherein the logarithmic amplifier has an exponentially decreasing gain as luminance levels rise.